Project Manager's Quarterly Progress Report – 1st Quarter FY 2002
U.S. Large Hadron Collider Construction Project

1. PROJECT IDENTIFIERS

Reporting Period:	Through **December 31, 2001**
Program Sponsors:	DOE High Energy Physics Division/NSF Physics Division
DOE/NSF Program Manager:	John O'Fallon, (301) 903-3624, john.OFallon@science.doe.gov
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DOE/NSF Project Manager:	J. Yeck, (630) 840-2530, jim.yeck@ch.doe.gov

2. PROJECT DESCRIPTION

The Department of Energy (DOE) and the National Science Foundation (NSF) have signed agreements committing to collaboration in the construction of the Large Hadron Collider (LHC) at CERN (European Laboratory for Particle Physics) and two of its associated detectors. The U.S. fabrication effort will be carried out at, or under the supervision of, U.S. universities and national laboratories under the terms and conditions described in the International Collaboration Agreement (Agreement) and its Accelerator and Experiments Protocols. The U.S. LHC Construction Project is defined by the goods and services to be provided to CERN under the terms of the Agreement between DOE, NSF, and CERN. These goods and services include DOE contributions to the LHC accelerator, and DOE and NSF contributions to the ATLAS (A Toroidal LHC Apparatus) and CMS (Compact Muon Solenoid) experiments.

The DOE contribution to the LHC accelerator consists of items provided by DOE National Laboratories and CERN direct purchases from U.S. industrial firms. The scope of these contributions is addressed in the Accelerator Protocol and described in detail in an Implementing Arrangement between the collaborating DOE National Laboratories and CERN. The DOE and NSF contributions to the ATLAS and CMS detectors consist of items supplied by the collaborating U.S. universities and DOE National Laboratories. The scope of these contributions is addressed in the Experiments Protocol and described in detail in Memoranda of Understanding for collaboration on construction of each experiment.

The U.S. LHC Construction Project includes the U.S. ATLAS, U.S. CMS, and U.S. LHC Accelerator projects. This report summarizes the overall status of the U.S. LHC Construction Project effort and includes more detailed status information on each sub-project. Additional information can be accessed at the following web sites:

U.S. LHC Project - http://www.hep.net/doe-hep/lhc.html

LHC Project - http://wwwlhc.cern.ch/	U.S. LHC Accelerator - http://www-td.fnal.gov/
ATLAS - http://atlasinfo.cern.ch/Atlas/Welcome.html	U.S. ATLAS - http://www.usatlas.bnl.gov/
CMS - http://cmsinfo.cern.ch/Welcome.html	U.S. CMS - http://uscms.fnal.gov/

3. PROJECT MANAGER'S NARRATIVE HIGHLIGHTS

The current list of DOE/NSF project reviews and status meetings is provided below:

U.S. LHC Construction Project	Event	Date
U.S. CMS Detector	DOE/NSF Review	November 15, 2001
U.S. LHC Accelerator	DOE Review	December 3-4, 2001
U.S. LHC Program/Project	DOE/NSF Joint Oversight Group	December 10, 2001
U.S. ATLAS Detector	DOE/NSF Review/Quarterly	December 11, 2001
U.S. CMS Detector	DOE/NSF Quarterly Status Meeting	March 1, 2002
U.S. ATLAS Detector	DOE/NSF Quarterly Status Meeting	March 6, 2002
U.S. CMS & ATLAS Detectors	DOE/NSF Review	June 3-6, 2002

The results of these activities are documented in formal reports and meeting notes. The U.S. CMS and ATLAS projects submit monthly reports and the U.S. LHC Accelerator project submits a quarterly report. Current performance data is summarized in the following tables:

Table 3.1, Schedule Performance Indices

	Planned Complete (BCWS/BAC)	Actual Complete (BCWP/BAC)	Schedule Performance (BCWP/BCWS)
U.S. ATLAS	64%	62%	97%
U.S. CMS	72%	64%	89%
U.S. LHC Accelerator	77%	72%	94%

Table 3.2, Contingency Status (in thousands of dollars)

	Total Project Cost (TPC)	Budget at Completion (BAC)	Contingency	Budgeted Cost of Work Performed (BCWP)	Remaining Work to be Performed (BAC-BCWP)	Contingency/ (BAC-BCWP)
US ATLAS	163,750	135,594	28,156	83,809	51,785	54%
US CMS	167,250	141,804	25,446	91,032	50,772	50%
US Accelerator	110,000	102,336	7,664	74,033	28,303	27%

Table 3.3, Cost & Schedule Performance (in thousands of dollars) Indices

	Cumulative Costs to Date					Costs at Completion		
	Budgeted Cost			Variance			Revised	
	Work Scheduled	Work Performed	Actual Cost	Schedule	Cost	Budgeted	Estimate	Variance
U.S. ATLAS	86,900	83,809	78,025	-3091	5784	163,750	163,750	0
U.S. CMS	101,804	91,032	81,548	-10772	9484	167,250	167,250	0
U.S. LHC Accelerator	79,056	74,033	74,006	-5023	27	110,000	110,000	0
CERN Invoices	29,092	29,092	29,092	0	0	90,000	90,000	0
U.S. LHC Total	296,852	277,966	262,671	-18886	15295	531,000	531,000	0

4. PROJECT MANAGER'S ASSESSMENT

The U.S. projects continue to meet their goals and are reliable and influential partners in the construction of the ATLAS and CMS detectors and the LHC machine.

Cost – Cost performance is good. Each project maintains an adequate level of contingency. The current Estimate At Completion for the U.S. LHC Accelerator project indicates contingency needs to be monitored closely.

The U.S. LHC Accelerator project office continues to actively and aggressively manage remaining contingency, and ensure realistic estimates for completion of all three Labs' activities. The project office has approved reductions in the accelerator physics effort, and CERN-initiated reductions in BNL RF region dipole magnet deliverables due to LHC design changes. Development of a new cost estimate and cryo feedbox rebaseline proposal continues.

The U.S. CMS contingency will drop slightly in coming months, as an approved scope change for Endcap Muon (EMU) electronics is implemented, resolving the issue of Russia's inability to provide this item. The project does not plan to use contingency in the near term, including any further scope considerations in FY02, in order to maintain a steady and adequate level. The U.S. ATLAS project continues to carefully manage contingency, and is completing a sensitivity analysis for each subsystem to re-confirm realistic contingency estimates. Open material commitments, and a lag in invoicing from vendors and collaborating universities continues to contribute to a high positive cost variance for both detector projects. This has been acknowledged and is being addressed to the extent possible.

Schedule - Schedule performance is measured through milestone completion and by earned value. These measurements indicate that schedule progress is slightly behind plans averaging about ninety-three percent of the baseline plan, indicating no major slipages in schedule. The total U.S. LHC Project is sixty-six percent complete, based on earned value. CERN's current schedule for completion of LHC is 2005, with collider commissioning initiating in 2006, first collisions in April 2006 and first physics in August 2006. The U.S. schedules are consistent with this goal, but CERN is reviewing the LHC schedule and there is possibility of delay.

The U.S. LHC Accelerator Project has updated the U.S. delivery milestones for deliverables to reflect the current CERN LHC installation schedule, and these have been approved. The updates define adequate float between expected U.S. delivery dates (based on the U.S. production schedules) and CERN installation requirements. A delay in the LHC machine schedule is not expected to have adverse impact on the U.S. LHC Accelerator Construction Project schedule. A U.S. CMS change request which incorporates the latest CMS schedule version and adjusts U.S. CMS milestones accordingly, has been approved. The U.S. CMS Project Office continues to track this latest schedule and consequent cost impacts on the project, to better plan installation and commissioning as well as U.S. construction project completion. U.S. ATLAS continues updating the baseline schedule and float for each subsystem to reflect ATLAS required delivery dates, based on the current CERN schedule and maintaining a U.S. construction project completion date of September 2005.

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Technical- Good technical progress continues across the project, and we remain confident that the U.S. deliverables to CERN can be realized with the planned funding. The U.S. LHC Construction Project deliverables are accepted by CERN and approved by the DOE/NSF Joint Oversight Group. We expect to provide additional items to CERN, within the approved funding, should cost performance be favorable.

Important milestones continue to be met. All required LHC D1 dipoles have been constructed by BNL, and testing is underway. U.S. CMS has delivered both Hadron Calorimeter barrel absorbers ahead of schedule, and calorimeter module assembly is nearly complete. In U.S. ATLAS, the first inner detector pixel IBM prototype electronics has been submitted to support future production. Additional technical Project highlights are given in section 5, and shown in the photos.

ISSUES

LHC Cost & Schedule- CERN continues to address reported cost increases for completion of the LHC, presented to the CERN Finance Committee in September '01. In addition to short-term cost-cutting measures, CERN has initiated a series of internal task forces to examine CERN's functioning and identify and analyze further savings. The CERN Council has established an international external review committee to examine CERN's LHC project, detector construction costs, and overall scientific program. An interim report on this is expected in March '02. CERN will seek approval of its overall LHC completion budget plan from the CERN Committee of Council at the June. '02 meeting.

CERN's current schedule for the machine is: ring closed/cold by 12/05, first collisions/pilot run starting 4/06, followed by a 3 month shutdown and first physics starting 8/06. Both experiments have developed initial detector configuration/installation plans to meet this schedule (with staging options), which is nonetheless challenging in both cases . The LHC machine schedule is also undergoing a review to be completed in March '02. If there are further technical delays and/or CERN is unable to secure sufficient additional funds, a schedule delay of up to one year is possible. DOE and NSF staff continue to closely monitor this planning activity.

ATLAS and CMS Resources– Estimates of the resources required to complete the experiments exceed the funding currently identified, as discussed at recent Resource Review Board (RRB) meetings. Funding shortfalls are driven by several factors: various institutes not meeting their original commitments, improved estimates of the funding required to complete the detectors, cost overruns on core items, exchange rate problems, and (mainly for CMS) civil construction delays. Both collaborations have been directed by the RRB's to develop financial plans for completing the detectors on time, and these will be presented at the April '02 RRB meetings. CMS and ATLAS are currently >50% complete, and excellent technical and construction progress continues. The U.S. contribution to the construction of ATLAS and CMS experiments is fixed at $331 million.

5. NARRATIVE SUMMARY

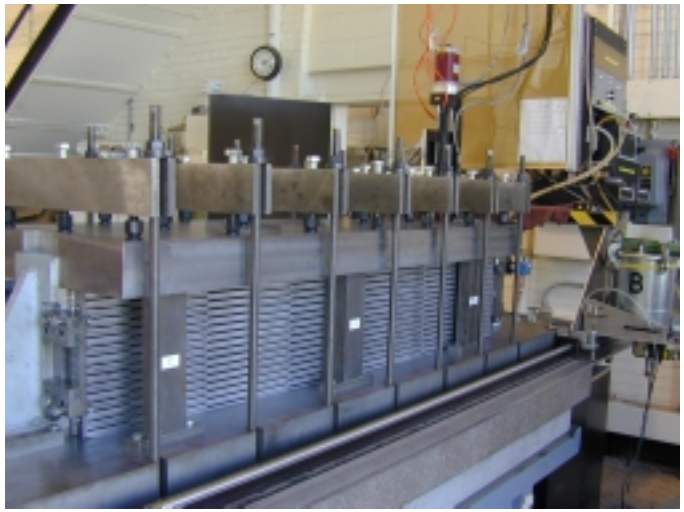
5.1 U.S. ATLAS CONSTRUCTION PROJECT

ATLAS International- An ATLAS Resource Review Board (RRB) meeting was held in October. ATLAS presented an increased "Cost to Completion", incorporating added costs for commissioning and integration, and noting a majority of extra construction costs are in common items (magnet, infrastructure, cryogenic systems). ATLAS has been directed to address supplementary costs through further staging of well-identified components, to be authorized by the RRB Chair. ATLAS is carefully evaluating further staging, and potential impact on physics, and also pursuing possibility of additional funds from international funding agencies. Other ATLAS highlights are summarized below:

- Inner Detector pixel engineering changes are proceeding to improve installation scenarios; silicon sensor delivery 40% complete with good quality; transition radiation tracker straw preparation in Russia is 60% complete.
- Electromagnetic Calorimeter barrel cryostat has successfully passed major tests; tile calorimeter submodule production is 95% complete, with identical submodules produced at ten different plants, world-wide.
- Toroid barrel and endcap production proceeds well in industry, with 90% of superconductor, 50% of coil winding and 25% of vacuum vessel production complete for the barrel toroid, and the first endcap toroid vacuum vessel delivered and accepted at CERN.

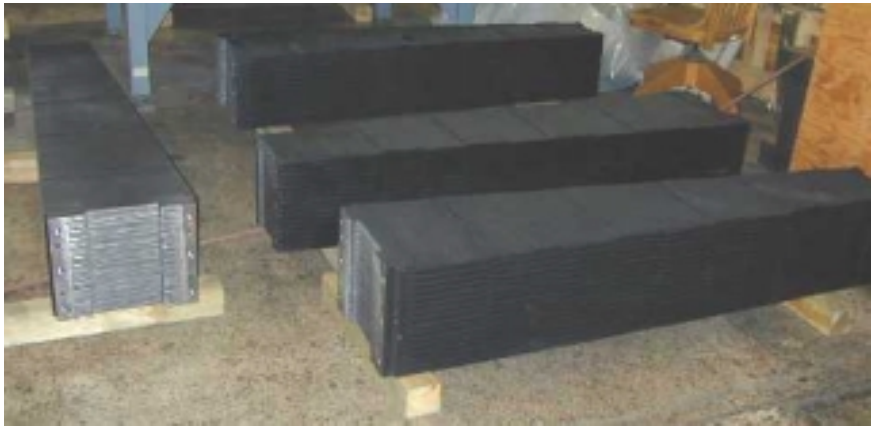
U.S. ATLAS - As of December 31, 2001 the project was actually 66 percent completed versus the 68 percent planned work. DOE reviews this quarter focused on muon system status, and U.S. ATLAS cost and schedule planning. All subsystems have been updating cost and schedule estimates for the remaining work to complete the baseline scope. A preliminary estimate has been developed. Muon chamber production shows good progress, but readout electronics are critical path. Prototype testing must progress for electronics production to proceed, and this will be monitored. The project is currently updating milestones for an upcoming baseline change request.

- Silicon Strips: Approximately 7% of ABCD chips have been delivered by the vendor. All components needed for module production have been started. Completing the Silicon ROD design is dependent on the availability of the SCT DAQ prototype which has been delayed.
- Transition Radiation Tracker (TRT) Electronics: The availability of the ASDBLR pre-production wafers has delayed the PRR and the production start for the TRT ASICS.
- Liquid Argon Calorimeter: The completion of the barrel feedthrough production will be delayed due to welding and testing work on the barrel.
- Tile Calorimeter: Instrumentation of the US Tilecal extended barrel modules continued on schedule. One module was completed at MSU and one was completed at ANL. A total of 45 modules out of 65 have been instrumented and tested.
- Muon: The ASD prototypes have undergone successful bench testing. The PRR is delayed pending the outcome of simulated production testing on a larger number of the chips.
- Trigger/DAQ : Work has started on specifying a set of standard values for parameters, such as trigger rate and event size that set High Level Trigger/DAQ performance requirements.



ATLAS Hadron Tile Calorimeter (Tilecal) Sub-module production involves many steps, such as gluing, pressing, and welding of the plates and layers. At left is a pressing machine used by the University of Illinois Urbana-Champaign (UIUC) for sub-module production.

The ATLAS Liquid Argon Electromagnetic Calorimeter barrel cryostat at CERN- a major U.S. deliverable from BNL, manufactured by Kawasaki. The installation of BNL-produced signal feedthrough's on one side is complete (including mechanical elements of High Voltage feedthrough's) and on the other side about a half of the feedthroughs have been installed.



Above are some finished UIUC Tilecal sub-modules. UIUC has completed its full commitment of 193 sub-modules, enough for 1/3 of the modules in a single extended barrel Tilecal section. UIUC is also testing 3,000 Photo-Multiplier Tubes, or 1/3 of the total, to be used in the ATLAS Tile Calorimeter.

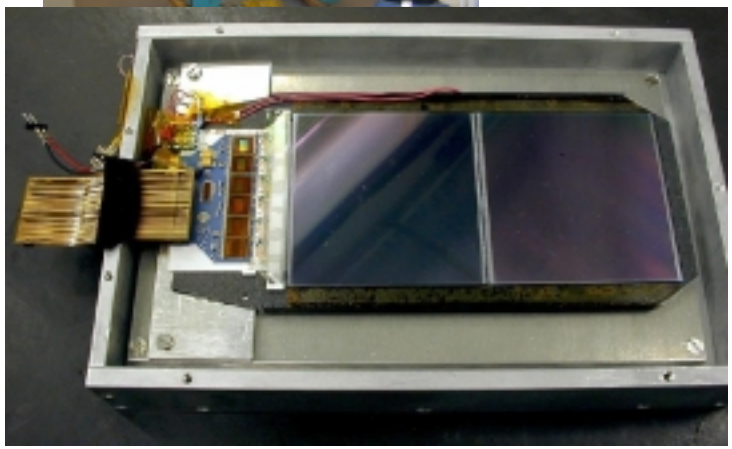
5.2 U.S. CMS CONSTRUCTION PROJECT

CMS International- A CMS Resource Review Board (RRB) meeting, and an LHCC Comprehensive review of CMS status/schedule/management were held in October. Responding to increased "Cost to Complete" (including added Commissioning and Integration costs) presented to the RRB, CMS is building a financial plan incorporating additional funding requests from international agencies, additional collaborators, and additional staging, to be presented at the April '02 RRB. The LHCC reviews were generally positive with respect to CMS having successfully addressed prior concerns. CMS is studying critical path for detector installation, based on the anticipated civil construction delay of ~3.5 months. Other CMS highlights are summarized below:

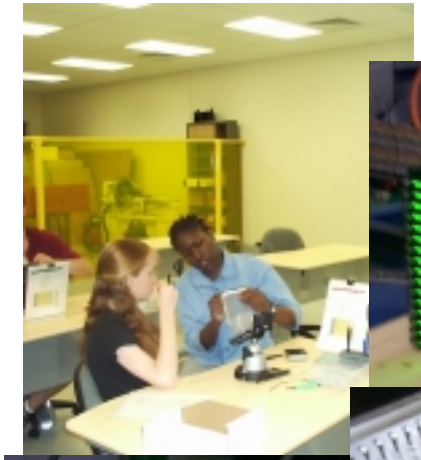
- The top of the UXC5 (underground experiment cavern) has been excavated over the full length, and excavation of the other cavern (for counting room and services) is proceeding.
- CMS magnet contracts, component delivery, and supporting infrastructure progress continues (conductors, platforms, compressor skids, inner cryogenics, and yoke metallic structures).
- The first Forward Hadron Calorimeter (HF) production wedge has been delivered to CERN from Chelyabinsk, after management approval for full production of this critical path item.
- Muon system drift tube (DT) and resistive plate chamber (RPC) production have progressed, with improved mass production of DT parts at Dubna and Protvino, and a final decision to use oil in barrel RPC production for optimal noise reduction and trigger performance.

U.S. CMS- As of 31 December, 2002 the overall U.S. CMS Construction Project was 64 percent complete vs. the scheduled 72 percent complete. A DOE/NSF Review was held on November 15, 2001. U.S. CMS is performing well with respect to cost and technical goals. The main schedule issue concerns LHC/CMS schedule uncertainty at CERN, and potential to impact the U.S. schedule for installation of some subsystems. U.S. CMS schedule is presently well-matched to latest CMS schedule and needs, and indicates no current major U.S. schedule slippage. Below are a few highlights of the U.S. CMS Construction Project:

- Endcap Muon (EMU) Cathode Strip Chamber (CSC) production is 50% complete at Fermilab; Prototype EMU Anode Local Charged Tracker (ALCT) electronics board testing has yielded good results to support start of CSC commissioning at Final Assembly and Test (FAST) sites.
- Both Hadron Calorimeter (HCAL) barrel sections (HB-1, HB+1) have been delivered to CERN on budget, ahead of schedule. HCAL optical megatile production is 95% complete. Procurement contracts for HCAL HPD's, optical fibers, and phototubes have been placed.
- Electromagnetic Calorimeter (ECAL) Floating-Point-Power-Amplifier (FPPA) electronics chip production will be subjected to a full technical review before the next submission; Northeastern University is preparing the procurement of radiation-hard ECAL barrel and endcap Analog to Digital Converters (ADCs).
- Forward Pixel system r&d is continuing with testing of a new Readout Chip design.
- Silicon Tracker system is preparing for production at Fermilab, with a parallel effort underway at University of California-Santa Barbara; assurance of upstream parts availability to support production is being established.

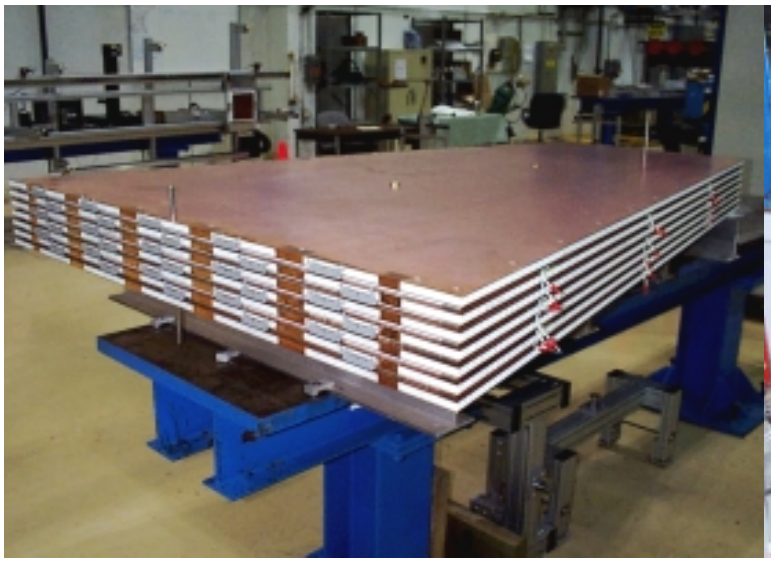


Through the "Quarknet" Education/Outreach program, U.S. CMS Physicists mentor and collaborate with physics teachers and students. Students, such as those pictured to the right at Notre Dame, can participate in research and development supporting frontier physics.

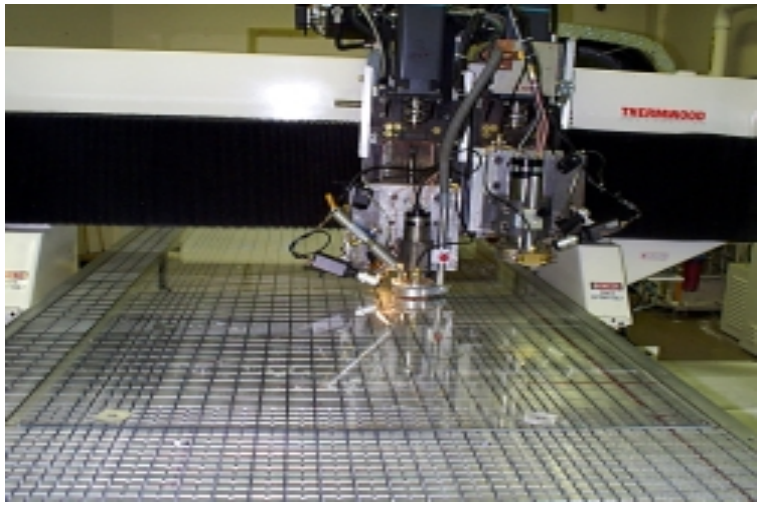


A module for the Silicon Strip Tracker is shown above. There are two silicon sensors per module. The U.S. will produce 6,000 silicon modules for installation in the CMS Silicon Tracker Outer Barrel sub-detector. Silicon module production and testing facilities are established at Fermilab, and are being expanded at the University of California, Santa Barbara (above inset), to provide additional production and testing capacity .

Hadron Calorimeter (HCAL) Optical Decoder Unit (ODU) Production at the University of Notre Dame. ODU's are components of the HCAL barrel region optical-electronic interface system. ODU quality control tests have been completed and show good results. ODU signal processing is tested using optical signals from lab sources, conveyed via ribbon cables of fiber optic waveguides. In the HCAL detector, optical signals from scintillator tiles will be carried to ODU and photodiode units comprising a "Readout Box", which is nearing production at Fermilab.



Above- Endcap Muon Cathode Strip Chamber (CSC) production is in full swing at Fermilab, with the ~three-year production cycle over 50% complete. CSC chamber #72, out of 144 to be produced has recently rolled off the production line at the Fermilab factory, shown above.



Left- Hadron Calorimeter (HCAL) scintillator tile production for the HCAL barrel wedges is over 95% complete. Scintillator tiles are shown in production at Fermilab facilities.

Hadron Calorimeter (HCAL) scintillator production for the HCAL barrel wedges is over 95% complete. At left, scintillator tiles are shown in production at Fermilab's facilities.

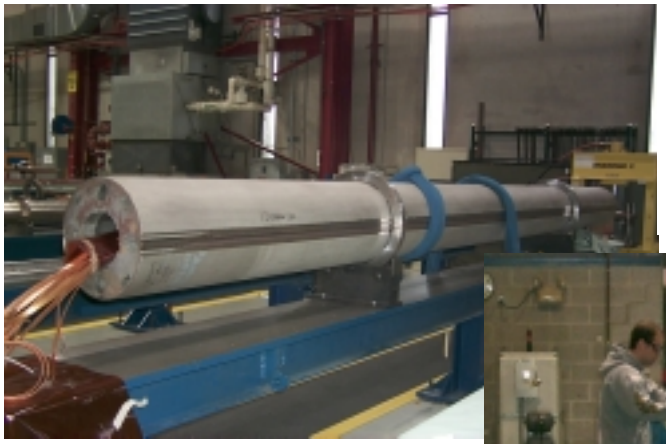
5.3 U.S LHC ACCELERATOR CONSTRUCTION PROJECT

LHC Accelerator- LHC cost overruns remain a major issue for CERN. A revised LHC schedule is also under review, to be released in March 2002. The current schedule is: first octant test-4/04; last dipole produced-4/05; rings cold-12/05; first beam-2/06; pilot run-4/06; shutdown-5-7/06; physics run-8/06. The LHC project is identifying ways to reduce the cost to complete, and CERN management is working with the CERN Council and Finance Committee to address the cost increases identified and revise the schedule as necessary. Other project status items follow:

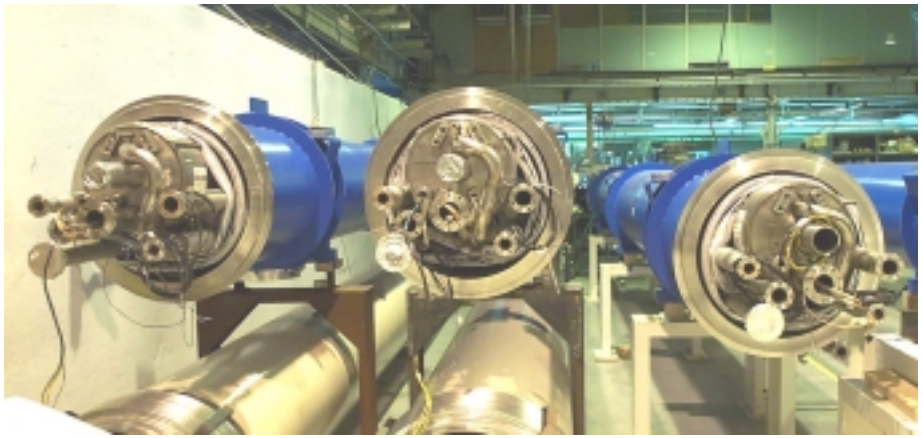
- CERN Council adjudicated the dipole magnet contracts in December, the last major accelerator contract; the Project can now proceed to sign dipole contracts with all three firms.
- Superconducting cable production and delivery rate continues to accelerate, but is 6-9 months behind the original schedule, compromising a continuous supply to the magnet vendors and posing a potential schedule impact.
- Running time of CERN accelerators will be reduced by ~25% in 2002 by CERN management, to add and strengthen resources for the LHC project.
- LHC main quadrupole circuits are being commissioned as the String 2 test continues, following achievement of nominal dipole current (~12 kA corresponding to 7 TeV energy).

U.S. LHC Accelerator- As of December 31, 2001, the overall project was 72% percent complete versus the scheduled plan of 77% percent complete. A DOE/NSF review was conducted December 3-4, 2001 at Fermilab. Technical progress remains good, and management is pursuing an aggressive plan to move the last remaining major item into production (the cryogenic feedboxes). The schedule of deliverables is slightly behind plans, but well in advance of CERN requirements. The project appears to have the previous cost growth under control, and has improved the level of available contingency. Project highlights are listed below:

- [Fermilab] There is good progress with inner triplet quadrupole magnet production; major elements for individual MQXB quadrupole magnets successfully completed (cold mass, collared coil assemblies and coil winding); tooling is in place for the first complete assembly of a MQXB quad.
- [BNL] With construction of all five D1 dipole magnets completed, magnet testing is underway and previous D1 cold-testing problems are resolved; the D1 magnet dropped previously has been repaired and re-inserted into the cryostat, and electrical and field quality tests indicate it is ok. Three D2 dipole magnet cold masses are complete, a fourth is in progress, and D2 cryostat vacuum vessels have arrived. D4 dipole magnet coil production has started. Three superconducting cable testing stations are now fully operational.
- [LBNL] The interaction region cryogenic Distributed Feedbox (DFBX) detailed design is about 95% complete; the project has involved the cryogenic industry in reviewing feedbox design and production, and is modifying design based on this feedback to improve manufacturability. Detailed design of the interaction region TAN and TAS absorbers is essentially complete and the design effort ramped down to a low level. Excellent progress continues in placing procurements for the TAN and TAS absorbers.

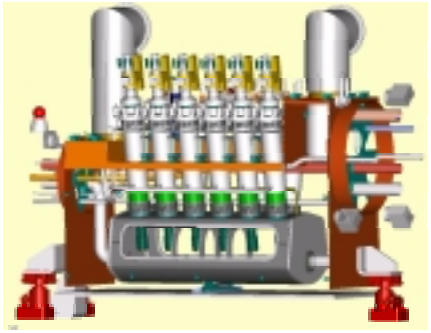


Above and right- Two interaction region quadrupole magnets under production at Fermilab. Above is a completed cold-mass for MQXB01. Shown at right is coil winding for the third production magnet (MQXB03).



Above- At BNL, completed interaction D1 dipole magnets are shown. All five D1 dipoles required have been constructed, and testing is underway at BNL.

Right- An LBNL computer model of the interaction region Distributed Feedbox (DFBX), showing complexity of design. This unit provides cryo, power, vacuum and instrumentation connections between the LHC and interaction regions. Design is 95% complete, with model and prototype work underway (see other pictures below and right). DFBX production planning is also proceeding.



Left- An LBNL High-Temperature Superconducting (HTS) electrical current lead, such as that to be used in the LHC DFBX . A prototype pair was delivered to CERN and successfully tested in November, '01.

Below- An LBNL model of the Helium Box for the DFBX (He box is the element shown at the bottom of the DFBX computer model above).

CERN Direct Purchases - DOE reimburses CERN for their payments to qualified U.S. vendors [Reference U.S.-CERN Agreement and Accelerator Protocol]. The status is shown in Table 5.1.

Table 5.1, Status of DOE Payments (in $000)

Contract Item Contract Item	Company (U.S. Supplier)	Amount Paid	Contract Price	w/ options & escalation
Niobium-Titanium Alloy Bars	Wah Chang	23,441	38,667	48,431
Niobium Sheets	Wah Chang	3,084	5,633	6,951
Polyamide Insulation Film	Kaneka High Tech Materials	920	5,425	6,510
Superconducting Cable	Outokumpu-Advanced Superconductor	1,236	16,447	20,985
LHC BPMS Button Feedthroughs	Ceramaseal	90	898	1,003
Cryogenic Temperature Sensor	Lakeshore	321		
Cryogenic He Mass Flowmeters	(tbd-contract in process)	0	1,200	1,200
(tbd-contract in process)	(tbd-contract in process)	0	(tbd)	3,134
Totals		29,092	68,270	88,214

6. FINANCIAL/COST STATUS AND PLANS

TOTAL PROJECT FUNDING PLAN (then year millions of dollars)*

Fiscal Year	FY96	FY97	FY98	FY99	FY00	FY01	FY02†	FY03	FY04	FY05	Total
Machine Funding Profiles (DOE)											
US LHC Accelerator	2.00	6.67	14.00	15.40	24.92	19.16	10.10	8.70	6.13	2.92	110
CERN Direct	0.00	0.00	0.00	8.09	8.29	8.08	11.20	13.40	23.20	17.74	90
Machine Total	2.00	6.67	14.00	23.49	33.21	27.24	21.30	22.10	29.33	20.66	200
Detector Funding Profiles (DOE and NSF)											
US ATLAS	1.70	3.71	10.05	25.63	28.43	26.77	23.16	24.71	14.69	4.90	163.75
DOE	1.70	3.71	10.05	9.00	16.49	14.48	10.51	17.42	14.69	4.90	102.95
NSF	0.00	0.00	0.00	16.63	11.94	12.29	12.65	7.29	0.00	0.00	60.80
US CMS	2.30	4.61	10.95	38.03	24.26	21.25	21.40	22.91	15.98	5.56	167.25
DOE	2.30	4.61	10.95	32.51	20.30	17.15	17.19	20.48	15.98	5.56	147.03
NSF	0.00	0.00	0.00	5.52	3.96	4.10	4.21	2.43	0.00	0.00	20.22
Detectors Total	4.00	8.32	21.00	63.66	52.69	48.02	44.56	47.62	30.67	10.46	331.00

TOTAL DOE & NSF FUNDS, COSTS, & COMMITMENTS (cumulative $000)‡

U.S. LHC Construction Project	A = Funds Allocated	B = Estimate Actual Costs	C = Open Commitments	D= B+C Total	A–D = Funds Available
U.S. ATLAS	119,448	78,025	4,647	82,672	36,776
U.S. CMS	122,792	81,548	14,686	96,234	26,558
U.S. LHC Accelerator	92,250	74,006	0	74,006	18,244
CERN Direct Purchases	35,660	29,092	0	29,092	6,568
Total	363,582	29,092	19,333	282,004	88,146

* This report includes a revision to the funding profile for the U.S. LHC Construction Project that is addressed in the FY 2001 budget planning for DOE. The revision to the original profile was made in order to better match the needs of the construction projects. This report also includes a change in the distribution of funds between the U.S. LHC Accelerator project and the CERN direct project to address delays in CERN invoices.

† DOE has imposed a temporary 85% cap on expenditures of FY02 funds.

‡ Based on financial reports from the U.S. LHC construction projects. NSF funding is provided after the beginning of the fiscal year and therefore it is necessary to carry-over funding into the subsequent fiscal years.

7. DOE/NSF COST BASELINES AT LEVEL 2 (in $000)

U.S. ATLAS Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Silicon System	17,795	0	17,795
1.2	Transition Radiation Tracker	9,194	0	9,194
1.3	Liquid Argon Calorimeter	43,771	0	43,771
1.4	Tile Calorimeter	9,290	0	9,290
1.5	Muon Spectrometer	26,391	0	26,391
1.6	Trigger/Data Acquisition System	10,957	0	10,957
1.7	Common Projects	9,179	0	9,179
1.8	Education	287	0	287
1.9	Project Management	8,280	0	8,280
1.10	Technical Coordination	450	0	450
	Contingency	28,156	0	28,156
	U.S. ATLAS Total Project Cost Baseline	163,750	0	163,750

U.S. CMS Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Endcap Muon	35,851	2,679	38,530
1.2	Hadron Calorimeter	39,143	147	39,290
1.3	Trigger and Data Acquisition	11,652	767	12,419
1.4	Electromagnetic Calorimeter	11,801	103	11,904
1.5	Forward Pixels	6,784	-13	6,771
1.6	Common Projects	23,000	0	23,000
1.7	Project Office	7,592	-1,047	6,545
1.8	Silicon	3,342	3	3,345
	Contingency	28,085	- 2,639	25,446
	U.S. CMS Total Project Cost Baseline	167,250	0	167,250

U.S. LHC Accelerator Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Interaction Region Components	56,154	-80	56,074
1.2	Radio Frequency Straight Section	17,148	- 1,165	15,983
1.3	Superconducting Wire and Cable	13,225	0	13,225
1.4	Accelerator Physics	3,606	-247	3,359
1.5	Project Management	13,695	0	13,695
	Contingency	6,172	1,492	7,664
	U.S. LHC Accelerator Total Project Cost Baseline	110,000	0	110,000

8. SCHEDULE STATUS AND PLANS

8.1 U.S. ATLAS Construction Project Milestones
The milestones have been updated with the new ETC baseline dates.

U.S. ATLAS Major Project Milestones (Level 1)

Description	Baseline Schedule	Forecast (F) Date	Actual (A) Date
Project Start	01-Oct-95	01-Oct-95 (F)	01-Oct-95 (A)
Project Completion	30-Sep-05	30-Sep-05 (F)	

U.S. ATLAS Major Project Milestones (Level 2)

Subsystem	**Schedule Designator**	**Description**	**Baseline Schedule**	**Forecast (F) / Actual (A) Date**
Silicon (1.1)	SIL L2/1	Start Full Silicon Strip Electronics Production	06-Jul-01	15-Jul-01 (A)
	SIL L2/2	Start Full Strip Module Production	07-Jan-02	15-Mar-02 (F)
	SIL L2/3	ROD Design Complete	01-Oct-01	17-Apr-02 (F)
	SIL L2/4	Complete Shipment of Silicon Strip Module Production	13-Oct-03	13-Oct-03 (F)
	SIL L2/5	ROD Production/Testing Complete	24-Jun-03	24-Jun-03 (F)
	SIL L2/6	Pixels 1st IBM Prototype Submitted	26-Jul-01	**12-Nov-01 (A)**
	SIL L2/7	Pixels Start IBM Production	13-Mar-03	13-Mar-03 (F)
	SIL L2/8	Pixels Start IBM Outer Bare Module Prod	22-Oct-03	22-Oct-03 (F)
	SIL L2/9	Pixels Disk System at CERN	13-Oct-04	13-Oct-04 (F)
TRT (1.2) Mechanical	TRT L2/1	Final Design Complete	31-Dec-98	07-Dec-98 (A)
	TRT L2/2	Module Production Complete (CUM 102)	31-Mar-03	31-Mar-03 (F)
	TRT L2/3	Barrel Construction Complete	16-Sep-03	16-Sep-03 (F)
Electrical	TRT L2/4	Select Final Elec Design	15-Jun-01	30-Aug-00 (A)
	TRT L2/5	Start Production of ASICS	18-Jan-02	18-Jan-02 (F)
	TRT L2/6	Installation Complete	04-Jan-05	04-Jan-05 (F)
LAr Cal (1.3)	LAr L2/1	Cryostat Contract Award	24-Jul-98	05-Aug-98 (A)
	LAr L2/2	Barrel Feedthroughs Final Design Review	30-Sep-98	02-Oct-98 (A)
	LAr L2/3	Start Electronics Production (Preamps)	30-Jun-00	30-Jun-00 (A)
	LAr L2/4	FCAL Mechanical Design Complete	14-Dec-98	15-Dec-99 (A)
	LAr L2/6	Level 1 Trigger Final Design Complete	04-Oct-01	30-Mar-02 (F)
	LAr L2/7	ROD Final Design Complete	12-Dec-02	12-Dec-02 (F)
	LAr L2/8	Motherboard System Production Complete	30-Jun-02	30-Jun-02 (F)
	LAr L2/9	Cryostat Arrives at CERN	15-May-01	02-Jul-01 (A)
	LAr L2/10	Barrel Feedthroughs Production Complete	15-Feb-02	1-Jun-02 (F)
	LAr L2/11	FCAL-C Delivered to EC	17-Oct-02	17-Oct-02 (F)
	LAr L2/12	FCAL-A Delivered to EC	08-Dec-03	08-Dec-03 (F)

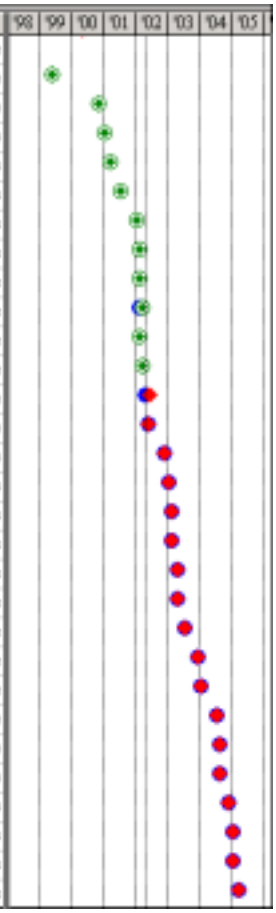
U.S. ATLAS Major Project Milestones (Level 2) (Continued)

Subsystem	Schedule Designator	Description	Baseline Schedule	Forecast (F) / Actual (A) Date
Tile Cal (1.4)	Tile L2/1	Start Submodule Procurement	01-Sep-97	01-Sep-97 (A)
	Tile L2/2	Technology Choice for F/E Electronics	15-Nov-97	15-Nov-97 (A)
	Tile L2/3	Start Module Construction	01-May-99	20-Sep-99 (A)
	Tile L2/4	Start Production of Motherboards	01-Apr-01	30-Mar-01 (A)
	Tile L2/5	All Electronic Components Delivered to CERN	01-Oct-02	01-Oct-02 (F)
	Tile L2/6	Module Construction Complete	30-Sept-02	30-Sep-02 (F)
	Tile L2/7	All Modules Delivered to CERN	02-Dec-02	02-Dec-02 (F)
Muon (1.5)	Muon L2/1	Start MDT Chambers Lines 1 and 3	17-Jul-00	15-Sep-00 (A)
	Muon L2/2	Start CSC Chamber Production	01-Sep-01	01-Oct-01 (A)
	Muon L2/3	MDT Electronics ASD PRR	19-Oct-01	31-Jan-02 (F)
	Muon L2/4	Final Design of Global Alignment Devices Complete	01-Apr-02	01-Apr-02 (F)
	Muon L2/5	CSC IC Production Complete	15-May-02	15-May-02 (F)
	Muon L2/6	Kinematic Mount Design Complete	30-Jan-01	30-Jan-01 (A)
	Muon L2/7	MDT Chambers (U.S.) Production Complete	27-Aug-04	14-Sep-04 (F)
	Muon L2/8	Kinematic Mount Production Complete	24-May-04	24-May-04 (F)
	Muon L2/9	CSC ROD Production Complete	05-Nov-03	05-Nov-03 (F)
	Muon L2/10	MDT Elec.'s Mezzanine Production Complete	06-Mar-03	06-Mar-03 (F)
	Muon L2/11	CSC Assembly/Testing at CERN Complete	17-Dec-04	17-Dec-04 (F)
	Muon L2/12	Global Alignment System Final Delivery	30-Sep-04	30-Sep-04 (F)
Trigger/ DAQ (1.6)	TDAQ L2/1	Select Final LVL2 Architecture	31-Dec-99	31-Mar-00 (A)
	TDAQ L2/2	LVL2 Trigger Design Complete	31-Dec-02	31-Dec-02 (F)
	TDAQ L2/3	LVL2 Trigger Prototype Complete	30-Sep-02	30-Sep-02 (F)
	TDAQ L2/4	Start Production	08-Jan-03	08-Jan-03 (F)
	TDAQ L2/5	Start Installation & Commissioning	05-Mar-03	05-Mar-03 (F)
	TDAQ L2/6	Production Complete	30-Jul-05	30-Jul-05 (F)
	TDAQ L2/7	LVL2 Installation & Commissioning Complete	30-Sep-05	30-Sep-05 (F)

8.2 U.S. CMS Construction Project Milestones

DOE/NSF Project Manager and U.S. CMS Project Management Group (PMG) Chair milestones (below) are under Change Control as described in the US CMS Project Management Plan. Any 3 month change from the previously approved date in these milestone requires the approval of the DOE/NSF Project Manager and PMG Chair.

System	Level?	CMS ID	Milestone	v27 Baseline	v31 Baseline	Start	Variance
			APM/DD Milestones	**NA**	**NA**	**Jan 31 '99**	**0 days**
HCAL	ML3*	HB-024	HB: Start Optics Production	Jan 31 '99	Jan 31 '99	Jan 31 '99	0 days
MUON	ML2*	M-011	Begin Assembly of Cathode Strip Chamb	Oct 31 '99	Jul 14 '00	Jul 14 '00	0 days
HCAL	ML3*	HB-026	HB-1 Optical Assemblies 100% Complete	Jul 31 '00	Sep 30 '00	Sep 30 '00	0 days
HCAL	ML2*	HB-010	HB-1 Absorber Delivered to CERN	Nov 30 '00	Nov 30 '00	Nov 30 '00	0 days
MUON	ML2*	M-013	Begin Mass Production of Electronics Bo	Aug 31 '00	Mar 31 '01	Mar 31 '01	0 days
HCAL	ML2*	HB-014	HB+1 Absorber Delivered to CERN	Dec 31 '01	Sep 30 '01	Sep 30 '01	0 days
HCAL	ML1*	HB-016	HB-1 End Module Assembly in SX5	NA	Oct 31 '01	Oct 31 '01	0 days
HCAL	ML3*	HL-039	HF: Start PMT Procurement	Oct 31 '01	Oct 31 '01	Oct 31 '01	0 days
CP	ML3*	S-059	End Assembly of YE+3	Oct 31 '01	Oct 31 '01	Nov 30 '01	22 days
SiTrkr	ML2*	T-027	Begin Sensor Module Construction (for I	NA	Oct 31 '01	Oct 31 '01	0 days
MUON	ML2*	M-014	Begin Mounting Electronics and Testing	Sep 30 '00	Nov 30 '01	Nov 30 '01	0 days
HCAL	ML3*	HB-029	HB+1 Optical Assemblies 100% Complet	Dec 31 '01	Dec 31 '01	Feb 28 '02	39 days
HCAL	ML3*	HL-005	Start HPD Procurement	Oct 31 '99	Jan 31 '02	Jan 31 '02	0 days
SiTrkr	ML2*	T-1070	25% of Rods Complete	NA	Jul 31 '02	Jul 31 '02	0 days
HCAL	ML2*	HL-011	HF: PMT Tests 100% Complete	NA	Sep 30 '02	Sep 30 '02	0 days
HCAL	ML1*	HB-017	End Assembly of HB+ (Barrel) in SX5	Jul 31 '02	Oct 31 '02	Oct 31 '02	0 days
ECAL	ML3*	E-027	ECAL Front-End Electronics Production	Apr 30 '00	Oct 31 '02	Oct 31 '02	0 days
HCAL	ML3*	HL-014	QIE ASIC Production Run Complete	NA	Dec 31 '02	Dec 31 '02	0 days
FPIX	ML2*	T-1002	Final Full Size ROC Submission(0.25micr	NA	Dec 31 '02	Dec 31 '02	0 days
HCAL	ML2*	HL-002	HCAL Front-End Electronics Production	Jun 30 '01	Mar 31 '03	Mar 31 '03	0 days
HCAL	ML2*	HL-018	HCAL HPD Tests 100% Complete	NA	Aug 31 '03	Aug 31 '03	0 days
MUON	ML2*	M-017	All 148 ME23/2 CSC's Delivered from UC	Oct 31 '03	Sep 30 '03	Sep 30 '03	0 days
FPIX	ML2*	T-1015	First Butterfly Ready	NA	Mar 31 '04	Mar 31 '04	0 days
ECAL	ML3*	E-045	All APDs Delivered	Feb 28 '04	Apr 30 '04	Apr 30 '04	0 days
SiTrkr	ML2*	T-1077	Delivery of TOB to the Tracker	NA	Apr 30 '04	Apr 30 '04	0 days
DAQ	ML2*	D-1014	Start of Readout and EVB Commissioning	NA	Jul 31 '04	Jul 31 '04	0 days
ECAL	ML3*	E-046	ECAL Front-End Electronics Production	May 31 '04	Sep 30 '04	Sep 30 '04	0 days
CP	ML1*	G-1010	UX Ready (Start Lowering Magnet Parts)	NA	Sep 30 '04	Sep 30 '04	0 days
TRIG	ML3*	D-1330	CSC: MPC Prod Test Complete	NA	Nov 30 '04	Nov 30 '04	0 days

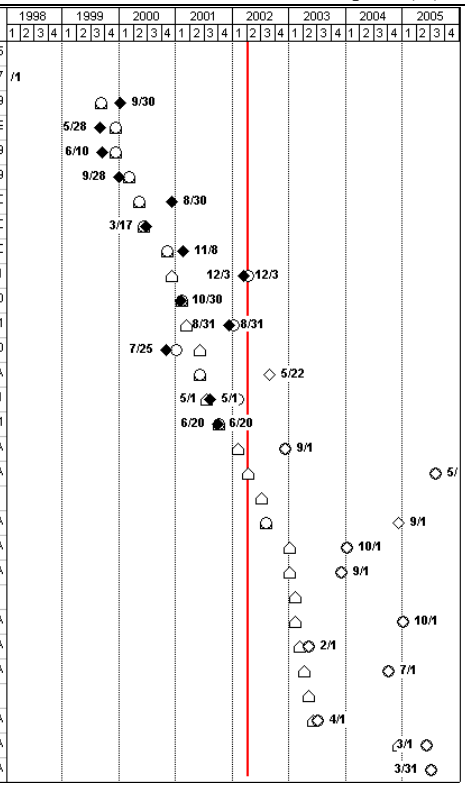


8.3 U.S. LHC Accelerator Construction Project Milestones

Table 8.3 Level 2 U.S. LHC Accelerator Baseline Milestones through FY2001

WBS Identifiers	Milestone Description	Baseline Date	Forecast(F) or Actual(A)
Project	Decision as to whether or not the US Project includes RF region quadrupoles	1 Jul 01	20 Jun 01 (A)
Int Region	Begin 1st inner triplet quadrupole model magnet	1 Jul 97	1 Jul 97 (A)
Int Region	Complete inner triplet quadrupole model magnet program phase 1	1 Dec 99	28 Sep 99 (A)
Int Region	Complete inner triplet quadrupole model magnet program phase 2	1 Mar 00	17 Mar 00 (A)
Int Region	Place purchase order for HTS power leads	1 Feb 00	30 Aug 00 (A)
Int Region	Begin absorber fabrication	1 Nov 00	30 Oct 00 (A)
Int Region	Complete inner triplet quadrupole prototype program	1 Oct 01	31 Aug 01 (A)
Int Region	Begin IR beam separation dipole production assembly	1 Oct 00	25 Jul 00 (A)
Int Region	Begin inner triplet feedbox fabrication	1 Mar 01	**22 May 02 (F)**
Int Region	Begin inner triplet quadrupole production assembly	1 Nov 01	1 May 01 (A)
Int Region	Complete 1st inner triplet quadrupole magnet	1 Sep 02	1 Sep 02 (F)
Int Region	Complete inner triplet feedbox fabrication	1 May 02	**1 Sep 04 (F)**
RF Region	Begin assembly of 1st dipole model magnet	1 Sep 99	10 Jun 99 (A)
RF Region	Complete dipole model magnet program	1 Aug 00	8 Nov 00 (A)
RF Region	Begin RF region dipole production assembly	1 Jan 02	1 Jan 02 (F)
SC Cable	All cable prod. support equipment delivered to CERN	1 Sep 99	28 May 99 (A)
SC Cable	Complete SC testing facility upgrades	1 Jun 99	30 Sep 99 (A)

Number	ID	Milestone	Revised	Forecast	Actual
1-1		Project Start (10/1/95)	Sun 10/1/95	Sun 10/1/95	Sun 10/1/95
2-1.1-1	IR	Begin 1st Inner Triplet Quadrupole Model Magnet	Tue 7/1/97	Tue 7/1/97	Tue 7/1/97
2-1.3-1	SC	Complete Superconductor Test Facility Upgrades	Tue 6/1/99	Thu 9/30/99	Thu 9/30/99
2-1.3-2	SC	All Cable Production Support Equipment Delivered to CERN	Wed 9/1/99	Fri 5/28/99	Fri 5/28/99
2-1.2-1	RF	Begin Assembly of 1st Dipole Model Magnet	Wed 9/1/99	Thu 6/10/99	Thu 6/10/99
2-1.1-2	IR	Complete Inner Triplet Quadrupole Model Magnet Program Phase 1	Wed 12/1/99	Tue 9/28/99	Tue 9/28/99
2-1.1-4	IR	Place Purchase Order for HTS Power Leads	Tue 2/1/00	Wed 8/30/00	Wed 8/30/00
2-1.1-3	IR	Complete Inner Triplet Quadrupole Model Magnet Program Phase 2	Wed 3/1/00	Fri 3/17/00	Fri 3/17/00
2-1.2-2	RF	Complete Dipole Model Magnet Program	Tue 8/1/00	Wed 11/8/00	Wed 11/8/00
2-1.2-3	RF	Begin RF Region Dipole Production Assembly	Tue 1/1/02	Mon 12/3/01	Mon 12/3/01
2-1.1-5	IR	Begin Absorber Fabrication	Wed 11/1/00	Mon 10/30/00	Mon 10/30/00
2-1.1-6	IR	Complete Inner Triplet Quadrupole Prototype Magnet Program	Mon 10/1/01	Fri 8/31/01	Fri 8/31/01
2-1.1-7	IR	Begin Interaction Region Beam Separation Dipole Prod. Assembly	Sun 10/1/00	Tue 7/25/00	Tue 7/25/00
2-1.1-8	IR	Begin Inner Triplet Feedbox Fabrication	Thu 3/1/01	Wed 5/22/02	NA
2-1.1-9	IR	Begin Inner Triplet Quadrupole Production Assembly	Thu 11/1/01	Tue 5/1/01	Tue 5/1/01
1-2		Decision on RF Region Quadrupoles	Sun 7/1/01	Wed 6/20/01	Wed 6/20/01
2-1.1-10	IR	Complete 1st Inner Triplet Quadrupole Magnet	Sun 9/1/02	Sun 9/1/02	NA
2-1.2-4	RF	Delivery of D3, D4 for IR4 right	Sun 5/1/05	Sun 5/1/05	NA
2-1.1-11	IR	Delivery of D2 for IR8 Left **DELETED**			
2-1.1-12	IR	Complete Inner Triplet Feedbox Fabrication	Wed 5/1/02	Wed 9/1/04	NA
2-1.1-13	IR	Delivery of All Inner Triplet System Components for IR8 Left (MQX,DFI	Wed 10/1/03	Wed 10/1/03	NA
2-1.2-5	RF	Complete RF Region Dipole Production Assembly	Mon 9/1/03	Mon 9/1/03	NA
2-1.1-14	IR	Delivery of D2 for IR5 Left **DELETED**			
2-1.2-6	RF	Delivery of D3, D4 for IR4 left	Fri 10/1/04	Fri 10/1/04	NA
2-1.1-15	IR	Complete Absorber Fabrication	Sat 2/1/03	Sat 2/1/03	NA
2-1.1-16	IR	Delivery of All Inner Triplet System Components for IR8 Right (MQX,DF	Thu 7/1/04	Thu 7/1/04	NA
2-1.1-17	IR	Delivery of D2 for IR8 Right**DELETED**			
2-1.1-18	IR	Complete Interaction Region Dipole Production Assembly	Tue 4/1/03	Tue 4/1/03	NA
2-1.1-30	IR	Complete Inner Triplet Quadrupole Production	Tue 3/1/05	Tue 3/1/05	NA
2-1.3-3	SC	Series Wire and Cable Testing Complete	Thu 3/31/05	Thu 3/31/05	NA



9. TECHNICAL BASELINE STATUS

U.S. ATLAS Construction Project - No change. The U.S. ATLAS collaboration defined a list of initial deliverables representing the U.S. contribution to ATLAS. This list was approved by the JOG in March 1998. Deliverables are listed in the U.S. ATLAS Construction Project Management Plan, Appendix 3.

U.S. CMS Construction Project - No change. The U.S. CMS collaboration defined a list of deliverables representing the U.S. contribution to CMS. This list was approved by the JOG in October 1998. The scope of U.S. CMS contribution is described in the U.S. CMS Management Plan, Appendix 2.

U.S. LHC Accelerator Construction Project - No change. U.S. LHC Accelerator Project - The U.S. deliverables to CERN are defined in the Implementing Arrangement to the Accelerator Protocol. The Implementing Arrangement was signed by the CERN and U.S. signatories in July 1998. Reference the U.S. LHC Accelerator Project Management Plan, Annex II, (Approved 6/15/98).

CERN Direct Purchases - No change. CERN will procure from U.S. industrial firms supplies required to construct the LHC accelerator. These supplies will include superconducting alloy, cable, insulation, and other materials.

10. BASELINE CHANGE ACTIVITY

Baseline Control Level	Baseline Changes
Level 1, DOE/NSF Joint Oversight Group	No Changes this quarter
Level 2, DOE/NSF Project Office	
U.S. ATLAS	No changes this quarter
U.S. CMS	Changes to the Level 2 cost, scope and schedule baseline.
U.S. LHC Accelerator	Changes to the Level 2 cost, scope and schedule baseline.

APPENDIX A - FUNDING BY INSTITUTION (in thousands of dollars)

U.S. CMS Construction Project

	FY 1998				FY 1999				FY 2000				FY 2001				
	DOE				DOE				DOE				DOE				Grand
Institution	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Total
FNAL	0	5,517	0	5,517	0	10,817	40	10,857	0	5,981	0	5,981	0	6,033	0	6,033	28,388
Fairfield	0	29	0	29	0	0	0	0	0	10	0	10	0	13	0	13	52
Maryland	90	65	0	155	0	132	131	263	0	250	0	250	0	189	0	189	857
Boston U.	0	32	0	32	31	111	0	142	0	132	0	132	0	88	0	88	394
Florida State	60	54	0	114	71	118	0	189	80	54	0	134	68	43	0	111	548
U. of Minnesota	60	95	0	155	161	452	0	613	141	202	0	343	153	401	0	554	1,665
U. of Iowa	77	62	0	139	20	5	0	25	0	453	0	453	0	843	0	843	1,460
U. of Rochester	127	1,159	0	1,286	262	485	0	747	441	253	0	694	464	143	0	607	3,334
Notre Dame	0	52	0	52	0	44	184	228	0	14	193	207	0	14	112	126	613
Purdue	38	135	0	173	49	166	0	215	0	175	0	175	0	89	0	89	652
U. of Miss.	46	100	0	146	68	91	0	159	69	108	0	236	0	235	0	235	776
U. of Florida	44	95	0	139	184	412	0	596	332	853	0	1,185	432	293	0	725	2,645
Ohio State U.	140	64	0	204	275	212	0	487	196	732	0	928	151	700	0	851	2,470
Carnegie Mellon	0	113	0	113	0	291	0	291	0	312	0	312	0	258	0	258	974
Rice	138	19	0	157	102	56	0	158	132	16	0	148	196	36	0	232	695
U. of Wisconsin	533	1,052	0	1,585	471	3,598	0	4,069	722	2,995	0	3,717	504	4,489	0	4,993	14,364
U.C. Davis	34	100	0	134	0	78	0	78	0	502	0	502	0	63	0	63	777
UCLA	150	87	0	237	249	173	0	422	244	391	0	635	347	546	42	935	2,229
U.C. Riverside	20	10	0	30	0	164	0	164	0	70	0	70	0	72	0	72	336
John Hopkins	0	29	0	29	0	0	70	70	0	0	40	40	0	0	5	5	144
Northwestern	0	59	0	59	5	26	0	31	0	114	0	114	0	39	0	39	243
Rutgers	0	13	0	13	0	0	34	34	0	2	140	142	0	0	101	101	290
Princeton	0	256	0	256	0	626	0	626	0	667	0	667	0	133	0	133	1,682
Caltech	0	148	0	148	0	458	0	458	0	367	0	367	0	452	0	452	1,425
U.C. San Diego	11	0	0	11	11	90	24	125	36	0	0	36	0	43	0	43	215
Northeastern	0	0	0	0	0	0	3,370	3,370	0	0	1,741	1,741	0	0	1,482	1,482	6,593
U. Ill.-Chicago	0	0	0	0	0	0	124	124	0	0	309	309	0	0	262	262	695
U. of Nebraska	0	0	0	0	0	0	24	24	0	0	2	2	0	0	100	100	126
MIT	0	37	0	37	15	67	0	82	0	78	0	78	0	87	0	87	284
Iowa State	0	0	0	0	0	0	19	19	0	356	0	356	0	29	0	29	404
Kansas State													0	66	0	66	66
LBL													0	554	0	554	554
Texas Tech													0	876	0	876	876
UC Santa Barbara													0	13	0	13	13
U. of Kansas													0	0	6	6	6
Subtotal	1,568	9,382	0	10,950	1,974	18,672	4,020	24,666	2,393	15,087	2,425	19,964	2,315	16,840	2,110	21,265	75,330

APPENDIX B - FUNDING BY INSTITUTION (in thousands of dollars)

U.S. ATLAS Construction Project																	
	FY 1998				FY 1999				FY 2000				FY 2001				
	DOE				DOE				DOE				DOE				Grand
Institution	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contra	NSF	Total	Total
ANL	0	1,098	0	1,098	0	967	0	967	0	922	0	922	0	172	0	172	3,159
BNL	0	3,903	0	3,903	0	2,581	0	2,581	0	6,429	0	6,429	0	6,630	0	6,630	19,543
LBNL	0	633	0	633	0	715	0	715	0	420	0	420	0	1,575	0	1,575	3,343
SUNY/Albany	20	0	0	20	48	0	0	48	50	0	0	50	0	0	0	0	118
U. of Arizona	320	100	0	420	634	0	0	634	557	0	0	557	298	0	0	298	1,909
Boston U.	224	0	0	224	298	0	0	298	287	0	0	287	155	0	0	155	964
Brandeis U.	265	45	0	310	0	0	593	593	0	0	478	478	0	0	731	731	2,112
U.C.Irvine	193	0	0	193	0	0	93	93	0	0	0	0	0	0	266	266	552
U.C. Santa Cruz	404	0	0	404	63	0	0	63	0	0	568	568	0	0	2,702	2,702	3,107
U. of Chicago	0	54	0	54	0	0	1,069	1,069	0	0	264	264	0	0	723	723	2,110
Duke U.	190	0	0	190	601	0	0	601	417	0	0	417	501	0	0	501	1,709
Hampton U.	0	0	0	0	0	0	538	538	0	0	293	293	0	0	331	331	1,162
Harvard	234	0	0	234	0	0	654	654	0	0	390	390	0	0	3,882	3,882	5,070
U. of Illinois	50	159	0	209	347	0	0	347	294	0	0	294	76	0	0	76	926
Indiana U.	190	0	0	190	765	0	0	765	460	0	0	460	0	616	0	616	2,031
MIT	50	0	0	50	105	0	0	105	177	0	0	177	190	0	0	190	522
Michigan State	0	35	0	35	0	0	178	178	0	0	293	293	0	0	0	0	506
Nevis/Columbia	0	675	0	675	0	0	2,680	2,680	0	0	1,422	1,422	0	0	103	103	4,880
U. of New Mex.	20	0	0	20	30	0	0	30	24	0	0	24	0	80	0	80	154
Northern Illinois	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ohio State U.	0	0	0	0	100	0	0	100	45	0	0	45	0	0	0	0	145
U. of Michigan	62	254	0	316	716	0	0	716	518	0	0	518	681	0	0	681	2,231
U. of Oklahoma	30	0	0	30	0	0	41	41	0	0	51	51	0	0	49	0	171
U. of Penn.	250	0	0	250	300	0	0	300	265	0	0	265	679	0	0	679	1,494
U. of Pittsburg	110	0	0	110	0	0	150	150	0	0	210	210	0	50	0	50	520
U. of Rochester	0	0	0	0	0	0	3,587	3,587	0	0	1,664	1,664	0	0	0	0	5,251
U.T. Arlington	50	82	0	132	0	0	474	474	0	0	230	230	0	0	0	0	836
S. Methodist	40	0	0	40	124	0	0	124	30	0	0	30	87	0	0	87	281
SUNY/Stony B.	27	0	0	27	0	0	1,045	1,045	0	0	1,037	1,037	0	0	426	426	2,535
Tufts University	50	0	0	50	20	0	0	20	20	0	0	20	0	0	0	0	90
U. Washington	0	0	0	0	0	0	240	240	0	0	318	318	0	0	1,377	1,377	1,935
U. of Wisconsin	230	0	0	230	429	0	0	429	665	0	0	665	1,014	0	0	1,014	2,338
Subtotal	3,009	7,038	0	10,047	4,580	4,263	11,342	20,185	3,809	7,771	7,218	18,798	3,920	9,123	10,590	22,625	71,704
Reserve	0	3	0	3	157	0	5,289	5,446	327	1,936	1,795	4,058	0	300	0	300	9,807
									0	2,602	2,928	5,530	0	0	0	0	0
Total	3,009	7,041	0	10,050	4,737	4,263	16,631	25,631	4,136	12,309	11,941	28,386	3,920	9,423	10,590	22,925	81,511